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Open charm and beauty measurements from small to large systems with ALICE

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In this contribution, measurements of open charm and beauty production via heavy-flavour hadron decay leptons, prompt and non prompt D^+ and D^0 in pp collisions are presented. In heavy-ion collisions, measurements of the production of leptons from heavy-flavour hadron decays and the modification of their spectra in different collision systems, like Xe–Xe and Pb–Pb, are discussed. The aforementioned measurements, together with the centrality-dependent measurements of the prompt D mesons, set new constraints to the modeling of the nature of parton energy loss and its dependence on the size of the QGP medium in transport-model calculations, highlighting that the collision geometry plays an important role in heavy-quark energy loss. The latest results on the centrality dependence of R_{AA} of beauty-decay electrons and non-prompt D^0 in Pb–Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV will also provide important constraint to the in-medium mass dependent energy loss. High precision measurements of elliptic flow (v_2) of heavy-flavour particles provide stringent information about the thermal degrees of freedom of charm and beauty quarks in the QGP, path-length dependence of heavy-quark in-medium energy loss and recombination effects. Measurements of higher flow harmonics, such as the triangular flow (v_3), provide further constraints on fluctuations in the initial state of the system and on the ratio of the shear viscosity to the entropy density of the QGP, η/s . The coupling of the charm quark to the light quarks in the underlying medium is further investigated with the application of the event-shape engineering (ESE) technique to the D-meson elliptic flow and p_T -differential yields. A strong correlation with the average bulk elliptic flow in both central and semicentral collisions is measured. Finally, the expected performance and projections of charm and beauty-hadron productions with ALICE in LHC Run 3 and Run 4 will be discussed.

Collaboration

ALICE

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